The Future of Supply Chain: How AI and Automation Are Transforming Logistics

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ABSTRACT :

In today's world of globalization where everyday there is an increase in the expectations of the customer, quality of logistics and also the need for supply chain industry, there is a heavy pressure on every possible aspect to provide a more affordable and less error prone service to the customers. The existing processes are not able reach the current and ever growing needs of the industry. This is where the role of automation and artificial intelligence comes into play and levels the playing field entirely to provide a great deal of efficiency and responsiveness to the current system. This article discusses on how these new trends and technologies are making an entire new scene across every aspect of the logistics industry with real-world examples, challenges and future prospects.

1. Introduction

In this digital age, where anything and everything is getting AI or automation integrated into it, the logistics industry is not an exemption to it. All the processes and machineries that depended on human commands and judgements are now shifting to depend more on the decisions taken by AI models which in turn are supplemented by smart technologies. This has enabled the logistics industry to attain a new and never before seen level of efficiency and also prevents errors.

Based on a recent report by McKinsey, using AI in the logistics industry provides the prospect to increase the value of the worldwide logistics industry up to a mark of $1.3 trillion annually. This includes smart warehouses, predictive transportation routing which in turn reduces waste and cost while also improving the satisfaction of the customers to a whole new level.
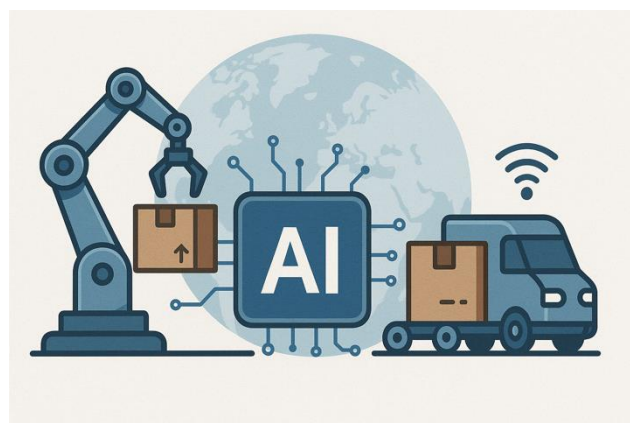
2. Understanding Traditional Supply Chains

In order to accurately measure the impact of AI in the logistics industry we first need to understand how the older and traditional logistics operations were carried out. The old systems actually involved various stages transporting goods starting from sourcing manufacturing storing transporting and delivery to all the customers. All these processes were all carried out by human workers which had a lot of errors, and the efficiency was very less as compared to the AI. The inefficiencies arise due to the following reasons:

- the visibility of the inventory was inefficient
- the lead times were very high
- documentation errors were an everyday sight
- disruptions in the process were common because of natural calamities or strikes

As the supply chain and logistics industry began growing in the face of globalization, there were no space for these errors or inefficiencies and thus they had to be eradicated or minimized. This is the point where companies and industries started to look for other ways to improve these efficiencies

3. Role of AI and Automation in Modern Logistics

3.1 Predictive Analytics

Using artificial intelligence models and modern analytical tools that uses these AI models, we can move efficiently use historical data and the current real time market values to foresee how the customer demand will change, what is the needed inventory levels and find out when would be the seasonal spikes. For example, using this AI powered predictive analytic tool a supply chain business can avoid overstocking their warehouses but the products that are very low in demand with their customers and during an off season.

3.2 Warehouse Automation

Artificial intelligence and IoT devices are used in smart warehouses in order to accelerate the process of all operations. There are many different IoT devices used in logistics services such as automated guided vehicles, robotic arms and also smart sorting systems which enables faster sorting of products and also faster shipping of those products. For example, Amazon's fulfillment centers are able to process nearly tens of thousands of orders per hour only using the help of these robotics and AI systems.

3.3 Smart Transportation & Fleet Management

Another main important aspect of logistics and shipping involve planning the routes of the transportation vehicles in order to optimize fuel consumption and faster delivery. For this, AI enabled route planning systems are used to find the fastest route possible to each customer which also in turn reduces the fuel consumption. This allows for predictive maintenance of the fleet vehicles which in turn reduces the vehicle's downtime.

3.4 Drones and Autonomous Vehicles

There's no doubt in seeing the future that drones, and autonomous driving trucks are the future in transportation of logistics and shipping industry. There are numerous startups in India whose only focus is to use these drones and autonomous driving vehicles for faster and efficient delivery of important healthcare and emergency supplies even to remote and rural areas in case of serious emergencies.

3.5 Real-Time Supply Chain Visibility

Combining the power of artificial intelligence with IoT devices we are able to achieve one full-fledged end to end visibility thus helping the employees of the logistics department to monitor the product movement in real time. This enables them to identify bottlenecks and react in an instant to any disruptions that may arise.

4. Benefits of AI and Automation

| Aspect	Benefit
Speed	**Faster fulfilment, reduced lead times**
Accuracy	**Minimization of human error in operations**
Cost Efficiency	**Lower labour costs, optimized fuel usage**
Customer Satisfaction	**Real-time tracking, timely delivery**
Sustainability	**Reduced emissions, smarter route planning, less energy usage**

Incorporating these technologies not only improves the efficiency of the operation but also what is the most sustainable. This aided by the case of companies like DHL and Maersk as they have reported significant drops in fuel usage and carbon emissions.

5. Real-World Applications

Let's look at a few organizations successfully using AI and automation:

- Flipkart uses artificial intelligence and IoT devices to predict which product may be in demand and thus automating their warehouse management in metropolitan cities like Bangalore and Hyderabad.
- Maersk, which is a global shipping giant, is using artificial intelligence for optimizing the routes of the delivery trucks which in turn increases their fuel efficiency.
- Zebra technologies incorporate artificial intelligence in a different way which allows them to monitor their inventory in real time using RFID tags and scanners in there retail and logistics department.

Not only major companies or tech giants but also governments are taking initiatives to incorporate artificial intelligence for better tracking. For example, India's unified logistics interface platform is working towards integrating artificial intelligence to digitize the national supply chain operation in order to increase the visibility in the supply chain market.
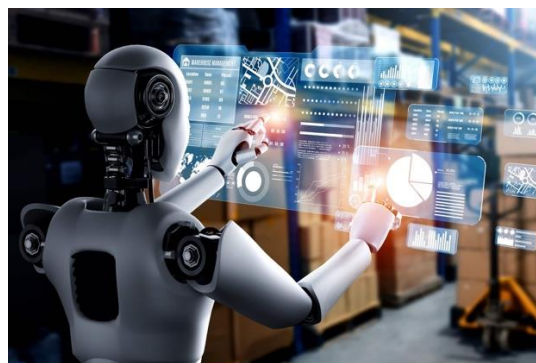
6. Challenges in Adoption
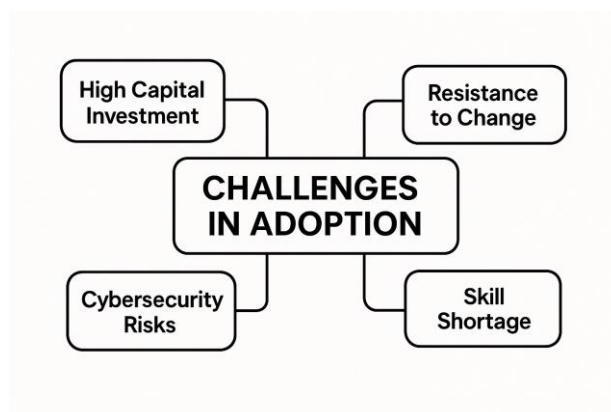
Even though we have discussed many potential advantages of implementing artificial intelligence and automation in supply chain systems even this, like everything, has some downsides to it.

- The initial investment to buy the hardware and software to incorporate artificially intelligent analytical devices is quite high and it may not be possible for small or growing industries to use them.
- Like every technological device, these IoT devices and its software are also prone to cloud based and digital cyber security attacks which pose a major security threat.
- The shift from traditional workforce to automation maybe a rocky road because the traditional workers can backlash in fear of losing their jobs.
- The skills required to use artificial intelligence and IoT devices are very professional and the number of skilled laborers in this domain is considerably less in our country.

Industries must take steps in order to reskill and educate their employees in order to make them more comfortable with the ever changing incorporation of artificial intelligence and other devices in the supply chain industry.

7. The Future of AI in Logistics

The future of AI automation and IoT devices in logistics and supply chain industry is quite a very bright one.

- Blockchain can be integrated in the supply chain system in order to create more secure and tamper proof documents.
- AI-powered Chatbots can be used in order to enhance customer services and improve order tracking.
- Digital twins can be used to simulate supply chain models which helps to test the scenarios before actually doing them.
- Sustainable logistics can be used smart packaging and reduced carbon emission tracking.

India is in a very bright position to be a major player in the AI supply chain industry because it has the support of both the government and the industries looking to incorporate artificial intelligence and IoT devices in their logistics and supply chain management system.

Conclusion

As we all know, artificial intelligence and automation are no longer some high tech futuristic ideas. It is the world that we are currently living in where without using artificial intelligence there's no room for improving efficiency in the logistics and supply chain industry. They make the reality in which smarter decisions are made, processes are running faster and the transparency in the system is way better than the old traditional methods. As a student who's eager to learn more about the logistics and the future of this industry I feel that it is very important for me to embrace these trends and contribute in order to improve this industry.